

Systematic Review
Trauma

Open treatment of unilateral mandibular condyle fractures in adults: a systematic review

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Abstract. Since the introduction of rigid internal fixation devices, more and more surgeons favour an open approach to treating condylar fractures of the mandible in adult patients. Different indications for open treatment have been published. Open treatment is associated with surgical complications because of the technique employed. The aim of this systematic review was to provide an overview of the studies published exclusively on open treatment, and to summarize the existing open treatment modalities and their clinical outcomes. A total of seventy studies were selected for detailed analysis. Most studies reported good results with regard to the outcome measures of open treatment. Surgical complications including hematoma, wound infection, weakness of the facial nerve, sialocele, salivary fistula, sensory disturbance of the great auricular nerve, unsatisfactory scarring, and fixation failure were reported in the studies. This review suggests that because of the high level of methodological variance in the relevant studies published to date, among other factors, there are currently no evidence-based conclusions or guidelines that can be formulated with regard to the most appropriate open treatment. Establishment of such standards could potentially improve treatment outcomes.

Key words: Mandibular condyle; mandibular fracture; operative; open; surgical.

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Since the introduction of rigid internal fixation devices, more and more surgeons favour an open approach to treating condylar fractures of the mandible in adult patients¹. Different indications for open treatment have been published^{2–5}. Based on the literature, strong indications for open treatment are, for example, displacement into the middle cranial fossa, inappropriate occlusal restoration by

closed reduction, lateral extracapsular displacement, and foreign material at the fracture site. Although there are other indications, such as bilateral mandibular condyle fracture in edentulous patients who cannot have a splint, where intermaxillary fixation and physical therapy are not possible because of internal disease, bilateral mandibular condyle fracture with comminuted fracture of other facial bones,

bilateral mandibular condyle fracture with jaw deformities, and a certain amount of shortening of the ramus and angulation of the condyle, controversies regarding open and closed treatment exist^{2,6,7}.

The main advantages of open treatment are the ability to restore the most ideal anatomical position. Further, open treatment can prevent complications, such as breathing problems, a pronunciation

disorder, or severe nutritional imbalance because of the shorter duration of maxillomandibular fixation (MMF). This will also potentially allow immediate mobilization of the joint, leading to more efficient functioning of the joint⁷⁻¹⁰.

Because of the technique employed, open treatment is associated with surgical complications. The most concerning complication is permanent damage to the facial nerve. Other surgical complications include malocclusion, pain, reduced mouth opening, restricted range of motion (ROM) of the mandible, weakness of the facial nerve, infection, haemorrhage, Frey syndrome, sialocele/sialofistula, damage of the great auricular nerve, plate fracture and screw loosening, and a visible scar¹¹⁻¹³.

In this systematic review, studies published on endoscopic or transoral approaches were excluded. Despite the advantages, including absence of scarring (if no transcutaneous trocars are used) and not crossing the facial nerve^{14,15}, it has been found that these intra- and transoral approaches are technically demanding, especially for fractures at higher levels or with medial luxation of the proximal stump^{14,16,17}. Therefore, in most cases, the intraoral approach is too difficult for both stabilization of fractures and screw fixation. Thus, some say that the intraoral approach can only be used in select cases of low subcondylar fractures, and that this approach requires special instruments, additional training, and a longer operative duration¹⁸⁻²¹. Therefore, we only addressed transcutaneous approaches in this review.

To date, controversies regarding the indications for the open treatment exist. Consequently, this systematic review focuses on the existing open treatment modalities and defines the outcome measures in accordance with our recently published review on closed treatment of mandibular condyle fractures²².

Methods

A systematic literature search was performed on April 29, 2016 using PubMed (all indexed years), MEDLINE (all indexed years), and Embase (all indexed years) with multiple search terms (Appendix A). The search excluded case reports with 10 or fewer subjects, endoscopic or transoral treatment modalities, and studies in which stainless steel wires for osteosynthesis were used. Reports published in English, German, or Dutch were considered for inclusion. All prospective and retrospective human

clinical studies that reported data relating to any form of open treatment of unilateral fractures of the mandibular condyle and the outcome of that treatment were included.

The following data were extracted from the selected studies: study design, period of follow-up, patient characteristics (age, gender), details of the fracture, details of the surgical approach, use of MMF, complications of the surgical approach and osteosynthesis material, and treatment outcomes.

Some studies included data on bilateral fractures and children; these data were excluded during data analysis.

Figure 1 shows a flow diagram of the inclusion process. First, two authors (R.B., A.R.) screened titles and abstracts for the potential relevance of the retrieved articles in a primary review process conducted in accordance with PRISMA criteria²³. Second, full articles were retrieved and relevant articles were designated for inclusion. Disagreement was resolved via discussion with a third person (L.D.). The included articles were critically appraised using a checklist with key criteria (Table 1 – available online at DOI: 10.1016/j.ijom.2017.06.018)²⁴.

Results

A total of 70 studies with a combined total of 3,052 patients, ranging from 11 to 230 patients in each study (with a male to female ratio of 2.7:1), were selected^{12,14,16,18,25-90}. The year of publication of the selected studies ranged from 1980 to 2016. The sample size in almost 50% of the studies was fewer than 100 patients. The mean age of the patients was 32.2 years, with a range of 4–91 years. In 19% of cases, both mandibular joints were fractured, and in 81% of cases, the fractures were unilateral. Of these fractures, 9% were located intracapsularly and 91% extracapsularly. The period of follow-up varied widely, from 5 days to 119 months. Yabe et al.⁸⁵ reported the longest period of follow-up at 119 months.

Retrospective studies

Of the assessed studies, 38 (54.3%) were retrospective in nature, and included a heterogeneous series of mandibular condyle fractures and treatment modalities. The clinical outcome measurements in these studies were diverse and the follow-up periods were variable (range

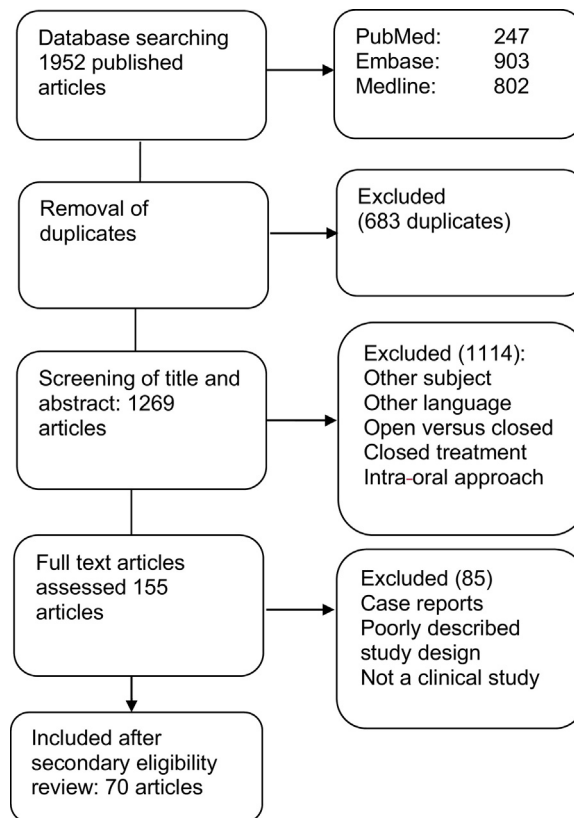


Fig. 1. A flow chart demonstrating the inclusion process.

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